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An iron-smelting site in the Hluhluwe Game Reserve, Zululand

by

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SYNOPSIS

A group of iron-smelting furnaces, located in the Hluhluwe Game Reserve, Zululand, is described. The results of excavation of six furnaces are discussed and radiocarbon dates are presented which show that the complex can be attributed to the Late Iron Age. Finally, the site is considered within the wider context of the later prehistory of Zululand.

INTRODUCTION

The Hluhluwe Game Reserve lies in the valley of the Hluhluwe River, Zululand, and forms a part of the larger Complex Reserve of which the Umfolozi and Corridor Reserves are also components. These sanctuaries are particularly important for archaeological research as they form one of the few extensive areas of valley lowveld environment without intensive human settlement on the south-east littoral of South Africa. In addition, the fact that the core areas of the Umfolozi and Hluhluwe Reserves were first proclaimed in 1897 has meant protection from the extensive soil erosion which has followed the removal of vegetation cover in other valley areas. As a result, archaeological sites are comparatively well preserved.

An additional factor which gives the Complex importance as a research area is that communities of indigenous flora have survived virtually intact. Hence it is possible to investigate the interaction between Iron Age populations and their biotic environments by comparing the distribution of the flora with the distribution of archaeological sites. Such interrelationships have been the subject of a major research project undertaken by the author in recent years.

As part of this research, surveys of archaeological sites have been carried out in certain parts of both the Umfolozi and the Hluhluwe Reserves, building on earlier work by Penner (1970). An outline of the results has already been published (Hall, 1979*a*) and a gazetteer of Iron Age sites compiled (Hall, 1979*b*). The purpose of the present paper is to describe the result of excavations at one site investigated during the course of the wider programme of fieldwork.

THE SITE

This site is a complex of smelting furnaces in the Sitezi area, near the confluence of the Hluhluwe River and the Kubi stream (Map ref. 28°06′50″S: 32°05′20″E). Its position is shown in Fig. 1. The furnaces were described to Penner by Mr P. Hitchins, and were subsequently listed in the first account of archaeological sites in the Complex as site number DP 235/70 (Penner, 1970). The site was excavated by the present author in 1978 and was catalogued as RV 29 in

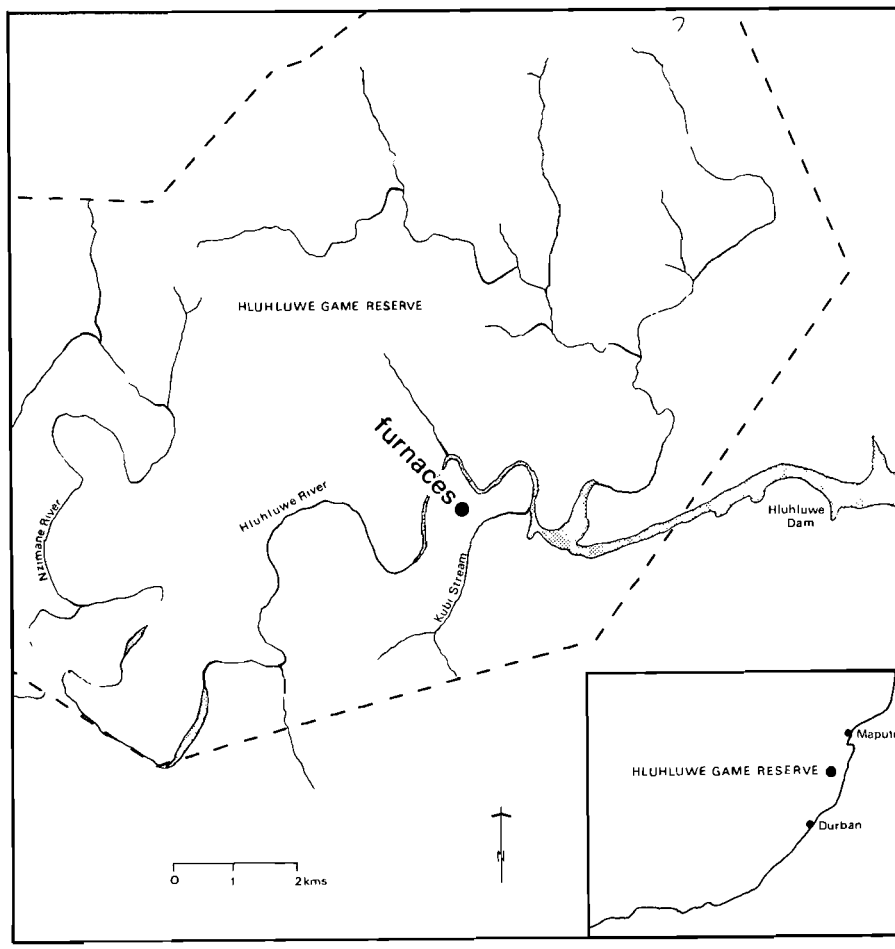

Fig. 1. Position of the smelting furnaces.

both the preliminary account of the fieldwork and the site gazetteer (Hall, 1979*a*; Hall, 1979*b*).

Along the immediate banks of the Hluhluwe are beds of deep, riverine alluvia, but above the floodplain soils are poorer, derived from faulted Beaufort deposits. The basin formed by the major river is flanked by older Ecca sediments (King, 1975). The vegetation of the valley today consists of a mosaic of closed woodland with occasional open glades. The alluvial soils support mature stands dominated by *Acacia robusta* and *Spirostachys africana*, but at slightly higher altitudes a low, dense thicket dominated in some areas exclusively by *Euclia divinorum* covers the gently sloping hillsides. This is a juvenile community which has replaced open expanses of grassland within the past three decades (Bourquin, *pers. comm.*).

The smelting site is located in this *E. divinorum* woodland. It consists of three sets of furnaces, located within a few hundred metres of one another on a gentle, northerly facing slope. For ease of description, these have been labelled as South

Unit, East Unit and West Unit, comprising two, six and eight furnaces respectively. Furnace layout and the plan of the total site are shown in Fig. 2.

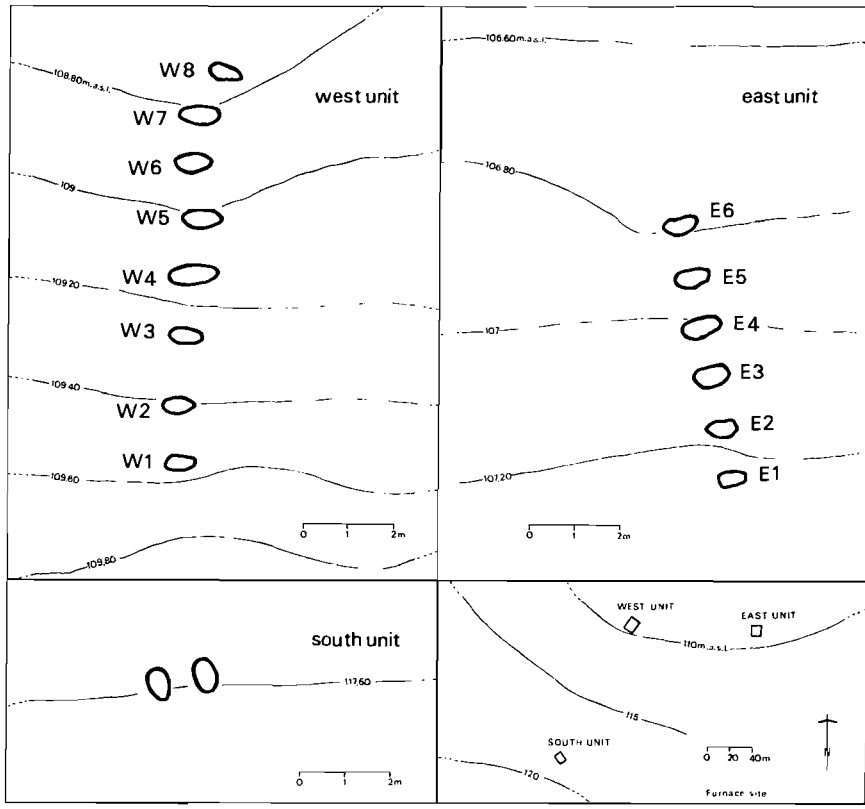

Fig. 2. Furnace layout and site plan.

THE EXCAVATIONS

Unfortunately, the furnaces in the South Unit had been too badly damaged by sheet erosion for detailed investigation, with the result that it was possible to excavate features only in the East and West Units. Fig. 3 shows the East Unit after the site had been cleaned and furnaces E1–E4 had been excavated. The deposits filling each furnace were sectioned and removed in horizontal, 10 cm spits. When the profile had been recorded the remaining material was removed and details of the complete interior walls of each feature recorded.

The depositional sequences in the East Unit furnaces were essentially repetitive; sections for E2 and E4 are shown in Fig. 4. There was, however, some variation in the composition of the uppermost spits, which consisted of a hard capping in furnaces E1 and E2 while the surface fill in both E3 and E4 was soft. This was probably due to differing micro-environmental conditions, as E1 and E2 were more exposed than E3 and E4, which were shaded by *E. divinorum* thicket.

Fig. 3. Furnaces in the East Unit.

Beneath the surface, the texture and coloration of the deposits changed progressively with depth in all four East Unit furnaces. The upper layers consisted of a pale grey soil and this graded into a darker, brown soil. Quantities of fired, red clay, varying from closely packed small fragments to large pieces, were recovered from these spits. It would seem that these deposits formed after the site had been abandoned. Soils washed in from the surrounding land-surface along with fragments of the furnace walls which were weathering and collapsing into the cavities of each.

In contrast, the basal deposits of all four furnaces were black in colour and contained large quantities of carbon. Some of this was extremely fragmentary, but larger pieces also occurred, some adhering to the walls of the furnaces. These deposits were probably the residual waste material left from the last firing before the abandonment of the site, an interpretation which is strengthened by the fact that large quantities of slag were found at the bottom of all four furnaces, while very little of this waste material was found in higher spits. Beneath the basal deposits was a clay soil, red in E1 and E4 but yellow in E2. The furnaces had no marked base of fired material, suggesting that refiring took place on a bed of accumulated debris which served to prevent vitrification of the soils underlying the furnace.

The furnace walls were almost vertical (Fig. 4). They consisted of hard, fired clay which was vitrified in places. As it was difficult to tell from their internal surface whether these walls were formed from the natural soil in which the furnaces had been dug, or whether the inside of each had been lined prior to

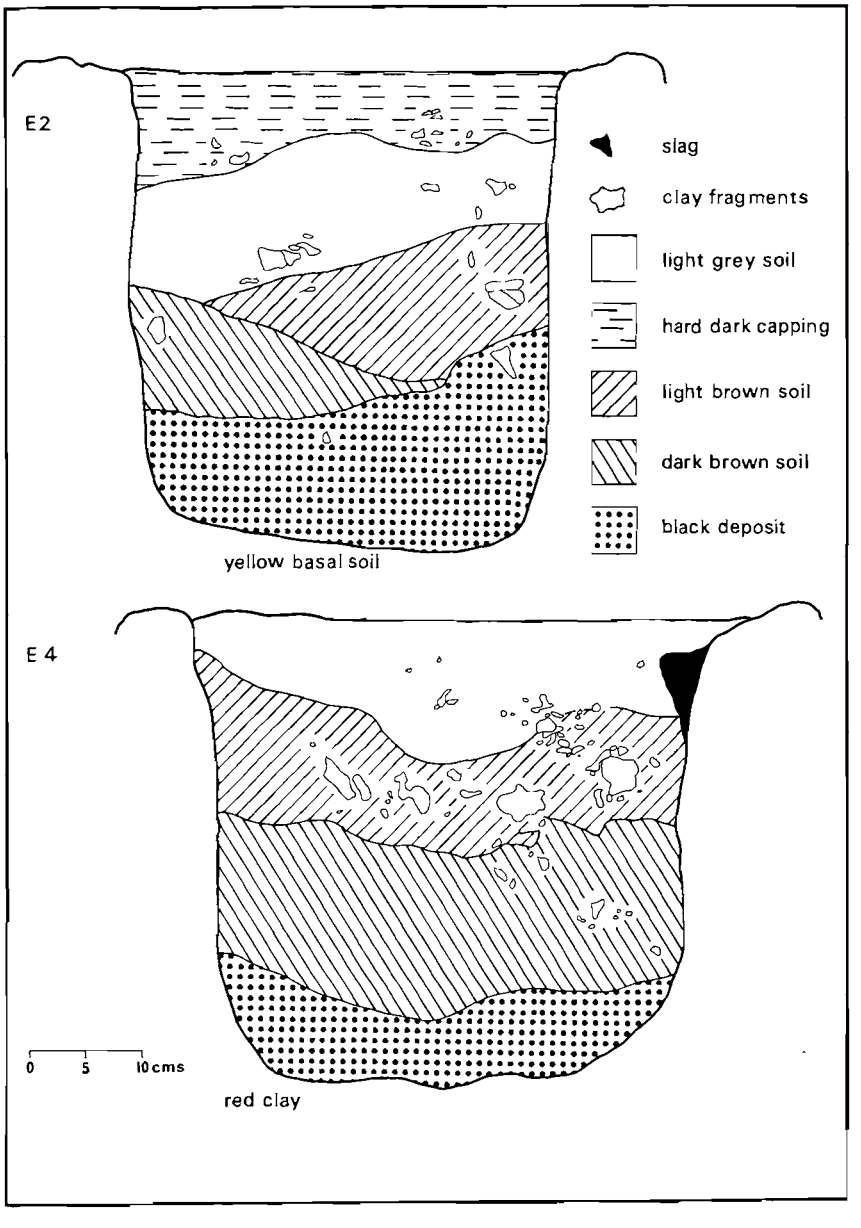

Fig. 4. Sections of excavated furnaces in the East Unit.

firing, a trench was placed between E3 and E4 in order to investigate the outer walls. This revealed a steady gradation from the undisturbed natural soil through to the baked interiors of the furnaces, suggesting that no additional lining had been needed in this case (Fig. 5).

The dimensions of the four furnaces in the East Unit are given in Table 1. They were remarkably uniform, being between 36 and 41 cm in maximum width and, with the exception of the shallower E3, just over 40 cm in depth.

TABLE 1
Dimensions of excavated furnaces in the East Unit

Furnace	Average Internal Width	Average Wall Thickness (top)	Maximum Depth
E1	36 cm	9 cm	43 cm
E2	38 cm	10 cm	43 cm
E3	41 cm	9 cm	33 cm
E4	41 cm	7 cm	42 cm

The West Unit consisted of eight furnaces, two of which were excavated (Fig. 3). Fig. 6 shows this line of furnaces after clearance and excavation and Fig. 7 illustrates the profiles of W2 and W5. All eight furnaces in this Unit were covered in soil, which reached a maximum depth of 18 cm at the downslope end of the furnace line (W8). However, when the site was first visited in 1969, the West Unit was fully exposed (Hitchins, *pers. comm.*) thus suggesting a fairly rapid rate of local topographical change.

In contrast with the East Unit, the uppermost spit of furnace W5 consisted of a soft, brown topsoil. Again, this would seem to reflect variation of micro-environment across the site as a whole, for the West Unit was protected from direct sunlight by *E. divinorum* thicket, thus preventing excessive drying of the deposits. Beneath this upper layer, however, the depositional sequence was much the same as that found in the East Unit. Again large fragments of red clay from the upper furnace walls were found buried in brown soils. Beneath these were the familiar black deposits, rich in charcoal and slag. The same depositional processes may therefore be deduced for both Units. However, one minor difference was revealed; the base of W2 consisted of hard, vitrified clay which formed a continuous lining with the furnace walls, suggesting that this furnace had been more adequately cleaned between firings.

The dimensions of furnaces W2 and W5 are shown in Table 2. It will be noted that they conform closely with the pattern established for the East Unit.

TABLE 2
Dimensions of excavated furnaces in the West Unit

Furnace	Average Internal Width	Average Wall Thickness (top)	Maximum Depth
W2	34 cm	8 cm	38 cm
W5	40 cm	7 cm	44 cm

Fig. 5. Trench between furnaces E3 and E4.

Fig. 6. Furnaces in the West Unit.

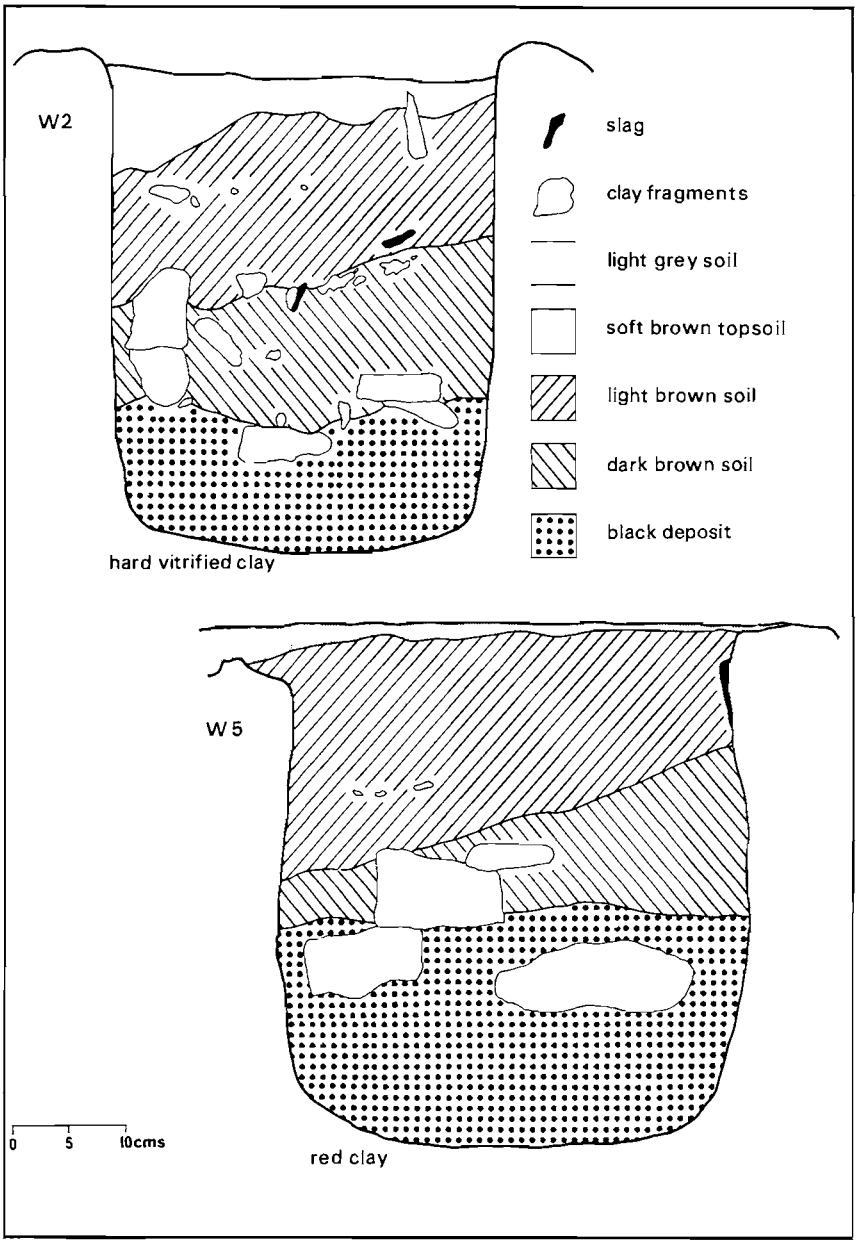

Fig. 7. Sections of excavated furnaces in the West Unit.

DATING

Samples of carbon were collected from two excavated furnaces and were submitted to Dr J. C. Vogel, CSIR, Pretoria, for radiometric dating. The sample from furnace E4, which consisted of fragments collected in spits 3 and 4, yielded a date of A.D. 1860 ± 50 (Pta-2445). Carbon collected from spits 3, 4 and 5 in furnace W5 was dated to A.D. 1790 ± 40 (Pta-2446). It should be pointed out that both determinations are uncalibrated and, because of the considerable fluctuations in the C^{14} content of the atmosphere over the last four centuries, it is unlikely that they reflect true calendar years. Vogel (*pers. comm.*) considers that both are definitely younger than A.D. 1650 and could indicate a true date as late as the first half of the nineteenth century. Thus both lines of furnaces clearly belong to the terminal phases of the Late Iron Age.

DISCUSSION

Before discussing the function of the furnaces and their place within the wider technological history of Zululand it is necessary to establish unequivocally that they were used for working iron. For copper smelting, although not recorded for Zululand, may result in waste products that are visually indistinguishable from the slag which follows iron-ore reduction. In order to resolve this problem a set of simple chemical tests have been outlined by van der Merwe (1978) and these have been conducted on samples from the Hluhluwe site. Samples of slag were treated with ammonia and hydrogen peroxide, but no traces of copper oxide were found. This may be taken as confirmation that the furnaces were used for smelting iron.

Any reconstruction of the furnaces must necessarily be speculative. It has been shown that excavation indicated that parts of the upper walling had fallen inwards following abandonment, demonstrating that the low walls preserved *in situ* are only foundation. However, the parts of the superstructure which were recovered were too fragmentary to allow an accurate reconstruction. Clearly, parts of the upper walling have been destroyed, probably because they collapsed outwards on to the unprotected land surface surrounding the furnaces. Despite this, however, it is possible to make some comments on construction. The walls were clearly substantial, with thick fragments of clay, vitrified in parts where they had been subjected to intense heat, representing the lower parts. Other pieces were thinner and had obviously been fired at lower temperatures. These could have been higher parts of the superstructure. The amount of material recovered from the furnace suggests that the walls stood at least 50 cm above ground level, giving the furnaces approximate depths of one metre each.

The shapes of the superstructure are also difficult to establish. However, they would clearly have been oval in plan, following the lines of the foundations. In addition, it is unlikely that the walls would have met to form a dome, as this would have prevented the exit of fumes during the process of reduction, although slight convergence would have helped in the conservation of heat. Therefore, the above-ground walling of the furnaces was a continuation of the foundations, producing a vertical sided cylinder, slightly inward sloping at the top.

One notable feature of the Hluhluwe site is the absence of inlets for the tuyère

pipes, which were used in the Iron Age smelting process to convey the draught of air from the bellows to the fire. In other similar industrial sites which have been excavated in this general area, such inlets were well preserved at the narrower ends of the oval-shaped furnace; an example is provided by the excavated site of Mabhija, in the Tugela Valley (Maggs, *pers. comm.*). Tuyères were certainly used at the Hluhluwe site as small fragments were found both on the surface near the furnaces and in excavated deposits. It must be concluded that the inlets were originally located above ground level in that part of the walling which has been destroyed since the site was abandoned.

Both the regularity of construction and the linear orientation of the furnaces in the East and West Units suggest that the furnaces comprising each unit were used in conjunction with one another rather than individually. In other sites, such as Mabhija, furnaces have been found in pairs (Maggs, *pers. comm.*) suggesting that two were operated together. However, with the exception of the South Unit, the Hluhluwe furnaces are evenly spaced, which raises the possibility that the entire lines, of six and eight furnaces, were used at the same time.

Ethnographic evidence for the technological processes involved is insubstantial. Although descriptions of forging iron exist, from both the nineteenth century (Angas, 1974) and from the twentieth (Schoeman, 1975), smelting seems to have ceased well before colonial observers began ethnographic records (Bryant, 1949), possibly because the availability of imported iron products rendered the technology redundant. However, Bryant (1949) was able to piece together some of the operations involved from fragmentary verbal evidence. Charcoal was prepared from suitable hard woods and the furnace was charged with alternate layers of this and of pieces of iron ore. The point of the tuyère was then placed beneath the charge and after ignition bellows were used to reach sufficient temperature to melt the slag. Evidence from other sites in Natal indicates that bellows were used at both ends of the furnace, and the oval shape of those from Hluhluwe suggests that this was also the case. If the furnaces in the East and West Units were used as sets, a possible method of operation would have been two lines of bellows operators, facing each other, with each man producing the draught for two adjacent furnaces.

The position of the Hluhluwe site was clearly not chosen at random, for the evidence suggests that location was determined by the location of raw materials necessary in the smelting process. Quantities of magnetite occur on the site itself, outcropping between the East and West Units as well as elsewhere in the immediate vicinity. Timber, suitable for producing charcoal, occurs in the woodlands of the Hluhluwe valley. Indeed, the fact that the site fell, until recently, into an open grassland regime, suggests that woodlands around the site were cut down by the Iron Age population. The thickets of *Euclea divinorum*, found around the site today, can be seen as the first stage of forest regeneration. This aspect of the interaction between the human population and the biotic environment is being further investigated.

Iron working would clearly have been important in the terminal stages of the Zululand Iron Age. By the time the Hluhluwe furnaces were in use the powerful chiefdoms which preceded the Zulu Kingdom had developed. Both trade and

internecine wars for dominance, which culminated in the *Mfecane* of the early nineteenth century, may have created a considerable demand for iron goods. There are, unfortunately, few recorded oral traditions for the Hluhluwe area and it is therefore difficult to supplement the archaeological information with historical data. However, it is known that the aba-kwa-Bakosini, who were known as iron workers, were domiciled in the general area (Bryant, 1929: 279). They, or a similar group, could have been the users of the excavated furnaces.

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